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Snow Surveyors Climbing to a Snow Course

FEDERAL-STATE COOPERATIVE
SNOW SURVEYS AND IRRIGATION WATER FORECASTS

for

MISSOURI and ARKANSAS DRAINAGE BASINS

MARCH 1, 1946

By

Division of Irrigation, Soil Conservation Service
United States Department of Agriculture
and
Colorado Agricultural Experiment Station

Data included in this report were obtained by the agencies named above in cooperation with the U. S. Forest Service, National Park Service, State Engineers of Colorado, Wyoming and New Mexico and other Federal, State and local organizations.



March 1, 1946

WATER SUPPLY OUTLOOK

MISSOURI-ARKANSAS DRAINAGE BASINS

The water supply outlook for the Missouri drainage in Montana is quite favorable and normal runoff may be expected unless deficient precipitation occurs during the remainder of the winter and spring months. Reservoir storage is practically identical with that of a year ago. The water prospects in the Black Hills area are fairly good. For the North and South Platte drainages in Wyoming and Colorado the outlook is favorable, no snow at lower elevations. Reservoir storage is remarkably good at this time. Snow cover on the Arkansas River drainage falls short of the March 1st normal. Outlook is not as bright as a month ago. Storage along river and tributaries is very good and a normal irrigation supply is well assured.

MISSOURI RIVER AND TRIBUTARIES IN MONTANA

JEFFERSON: On the headwaters of the Jefferson the present average water content of the snow is 8.0 inches, which is 2.5 inches more than it was a year ago at this time. The present water supply outlook for normal runoff is very good and no shortage in irrigation water supply may be expected for this season.

MADISON: For this drainage the present water content of the snow is 20.5 inches as compared with 13.2 inches a year ago, the present condition being about 25 percent above the past 11-year average. The outlook for the coming season's water supply is good and no water shortage is expected at this time.

GALLATIN: On the headwaters of this stream the present water content is 10.9 inches, which is approximately double that of a year ago, and about 30 percent above normal. The outlook for runoff in the Gallatin is quite satisfactory at this time.

MARIAS: The water content of the snow on the headwaters of this stream is now 15.3 inches, which is 50 percent above that of last year and approximately 20 percent more than the past 11-year average. Likewise for this stream the runoff is expected to be normal and no water shortage is anticipated at this time.

MISSOURI: In the snow cover area tributary to the Missouri River, for that section between Helena and Great Falls, the water held in snow storage averages about 7.6 inches or 15 percent above the 11-year average. Last year at this time the water content was 5 inches.

YELLOWSTONE: On the headwaters of this stream recent snow surveys show the average water content to be 7.7 inches, last year 5.4 inches and is now 10 percent more than the past 11-year average. The runoff in the Yellowstone this coming season will be sufficient to meet irrigation needs. However, late water for crops may be short.

MILK RIVER: The prospects for the coming season's irrigation supply is fairly good at this time and much improved over that of a year ago. The present average water content of the snow on the drainage is 20 percent more than a year ago and also 20 percent above normal.

SHOSHONE RIVER: The outlook for runoff in the Shoshone River continues to be good, as the average water content of the snow cover is now about 15 percent above that of last year at this time, and slightly above normal. During the month there has been a withdrawal from the Shoshone reservoir of about 18,000 acre feet and the storage now stands at 362,000 acre feet as compared with 288,000 at this time a year ago. It is expected that the runoff from the upper drainage will be sufficient to fill this reservoir to capacity. Over the irrigated area in the Powell district the agricultural conditions are fair to good. At this time the area is bare of snow and the spring farming operations are getting under way.

BIG HORN RIVER: During February the snow conditions on the upper drainage of the Wind River, and its tributaries, improved. At this time the average water content of the snow is about 20 percent above that of last year and approximately 10 percent above normal. In the irrigated areas in the vicinity of Wind River and Riverton soil moisture is reported to be generally normal and range conditions are good. Stream flow at this time is normal. Reservoir storage in these districts is approximately the same as it was a year ago. Because of subnormal precipitation during February in the lower country, there has been little inflow to the streams due to low snow cover.

CHEYENNE RIVER: The snow cover in the Black Hills country is fairly good at this time. On the headwaters of Castle Creek there is a 22 inch depth of snow and it is likely that the runoff in the Cheyenne River will approximate normal. It is not expected that there will be a water shortage in the irrigated areas served from this stream. Present agricultural conditions throughout the irrigated area are fair to good. The storage in the Belle Fourche reservoir is now 133,000 acre-feet as compared with 124,000 a year ago. This reservoir is now $2/3$ filled.

NORTH PLATTE RIVER: The snow cover on the headwaters of this stream in Wyoming and Colorado approximates that of a year ago and also is normal at this time. The outlook for runoff is now favorable. Because of the excellent storage in the principal reservoirs on this stream, now totalling about 1,000,000 acre-feet, the water supply for irrigation this coming season is now virtually assured. Stream flow has been normal and during February the storage in these river reservoirs has increased nearly 30,000 acre-feet.

On the Pathfinder Irrigation District, Lake Alice now stores 32,000 acre-feet as compared with 19,000 a year ago. In the lower North Platte valley the combined storage of the Kingsley-Sutherland reservoirs now totals 1,185,000 acre-feet, while last year it was 780,000. Because of the subnormal precipitation during February the soil moisture in the lower valley is poor and in the Torrington area it is fair and crop conditions fair. At this time there is no snow in the irrigated areas along the North Platte valley.

SWEETWATER RIVER: The snow cover on the Sweetwater River drainage has a water content of 40 percent more than last year and is now 20 percent above normal. The prospects for runoff are fairly good at this time. On the Grannier Meadows snow course there is a 3 foot depth of snow, holding 10 inches of water. There will be realized additional storage in the North Platte reservoirs due to the runoff in this stream this coming spring.

LARAMIE RIVER: The recent snow surveys on the headwaters of this stream show the water content to be the same as last year, and also approximately equal to the past 11-year average. The outlook is quite promising at this time but it is doubtful whether the stage of flow will reach that of last year. Soil moisture conditions throughout the farming areas are fair to good and stream flow normal or better at this time of the season. Range and crop conditions are fair to good. There is no low snow on the drainage and the valley areas are also bare. The Wheatland reservoirs now store approximately 50,000 acre-feet, which is nearly four times the amount held March first last year.

SOUTH PLATTE RIVER BASIN

CACHE LA POUDE RIVER: The water content of the snow on the headwaters of this stream now is the same as last year and 15 percent above the 11-year average. The recent snow survey on Cameron Pass shows an average depth of 54 inches containing 18.6 inches of water. At this time the outlook is for a substantial runoff but it is not expected during this season to exceed that of 1945. Storage in the mountain and valley reservoirs is very good at this time and much above normal for this time of year. The principal reservoirs show a combined total storage of 42,000 acre-feet as compared with 28,000 at this time last year. In the irrigated area of the lower valley soil-moisture conditions are poor. However, streams are flowing at normal stage, which provides additional storage in the valley reservoirs.

BIG THOMPSON RIVER: The water content of snow on the headwaters of the Big Thompson is normal and the same as it was a year ago. In the Loveland irrigated area soil moisture is low. However, crop conditions are fairly good. Winter wheat fields are greening and farming operations are well under way. The combined reservoir storage in the lower valley is 39,000 acre-feet as compared with 33,000 a year ago. Most of this storage is held in Boyd Lakes.

ST. VRAIN RIVER: The recent snow surveys on this drainage show the water content to be slightly below that of last year. However, it approximates the 11-year average. In the Longmont area, because of deficient precipitation, soil moisture is low. However, crop conditions appear to be fairly good. Reservoir storage in this area is about double that of a year ago.

BOULDER CREEK: The prospects for runoff in these streams are fairly good at this time, as based on recent snow surveys which show the water content to be about 10 percent more than last year, and 36 percent above normal. Crop conditions over the irrigated area of this drainage are fair at this time. Streams are at normal stage and because of timely storms during February the winter wheat fields are now starting off nicely. Farming operations are also well under way. The present reservoir storage aggregates about 14,000 acre-feet as compared with 10,000 a year ago.

CLEAR CREEK: The outlook for normal runoff in Clear Creek this season is fairly good, as based on water held in the snow on the headwaters, which contains about 30 percent more water than last year and 20 percent above normal. The reservoir storage in the lower valley aggregates 62,000 acre-feet as compared with 36,000 March first last year.

CROW CREEK: In the Pole Mountain area east of Laramie, the snow cover increased in depth and water content during February. The present snow water storage on the drainage is about $2\frac{1}{2}$ inches and will provide a limited runoff during the spring months. It is not expected that the late summer water supply will be ample to meet irrigation needs in the lower valley. It is probable that little or none of the runoff from snow will reach the South Platte River.

SOUTH PLATTE RIVER: The snow conditions on the headwaters of the South Platte River above Denver are found to be about 64 percent better than they were a year ago and 30 percent above normal. It can be expected at this time, as based on snow cover conditions, that there will be a substantial runoff during the spring and early summer of this year. The mountain reservoir storage is excellent at this time, aggregating about 193,000 acre feet as compared with 170,000 a year ago. Throughout the irrigated area below Denver, soil moisture is low due to deficient precipitation during February. Streams are normal and crop conditions are fair to good. In the Fort Lupton district the reservoir storage is good. The combined storage in the principal

reservoirs in that district totals 64,000 acre-feet as compared with 39,000 March first last year. In the Sterling district the combined storage in the principal reservoirs in this part of the South Platte valley totals 117,000 acre-feet as against 87,000 a year ago. River flow is normal for this time of year. Soil moisture is low. However, crop conditions appear to be fairly good.

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For this drainage area as a whole, the outlook for the coming season's water supply is fairly promising as based on the high mountain snow cover. The ultimate runoff can be expected to be less than when there is normal snow at medium elevations. Throughout this basin there is a deficiency of snow cover at elevations below 7,000 feet during February. There has been little or no snow in the foothills area or over the irrigated area of the valley and tributary areas. Throughout the irrigated areas the winter wheat fields are starting off nicely and farming operations appear to be well advanced at this time. Because of the excellent carry-over from last year, the present reservoir storage is good to excellent throughout the entire basin.

ARKANSAS RIVER: Snow conditions on the headwaters of the main Arkansas declined during February. The March first snow surveys indicate that for the high mountain country in Wyoming and northern Colorado, the water content is normal or better and becomes less southward into the Arkansas drainage and throughout the Rio Grande basin. The outlook for a favorable runoff in the Arkansas and its tributaries is now less favorable than it was a month ago. At present the water content of this drainage averages about 80 percent of last year and is also 80 percent of the past 11-year average. At this time it is not anticipated that there will be a water shortage in the Arkansas Valley because of the very excellent reservoir storage held in the mountain and valley reservoirs. There is now about 360,000 acre-feet held in storage, while last year it amounted to 320,000 acre-feet. Because of this ample reserve water supply, it is not expected that there will be a shortage of irrigation water this coming season. Generally, the agricultural conditions throughout the valley and the several tributaries are fairly good. In the upstream area soil moisture is reported to be low, whereas in the Lamar district conditions are more favorable because of recent heavy snow.

SNOW SURVEYS AND IRRIGATION WATER FORECASTS
FOR MISSOURI AND ARKANSAS RIVERS
March 1, 1946

P R E C I P I T A T I O N D A T A

WATERSHED	STATE	Precipitation October 1 to February 28 Inches	Departure from Normal Inches	Precipitation February Inches	Departure from Normal Inches
Missouri	East Mont.	2.34	-0.56	0.22	-0.23
Missouri	Cent. Mont	3.03	-0.66	0.37	-0.23
Missouri	North Wyo.	4.72	-0.65	0.60	-0.39
North Platte	Wyoming	3.03	-1.19	0.51	-0.39
South Platte	Colorado	4.54	-0.16	0.47	-0.59
Arkansas	Colorado	3.37	-1.04	0.55	-0.41

Precipitation for the period from October 1 to February 28 over the watersheds of the Missouri River in Colorado, Wyoming and Montana, and the Arkansas River in Colorado, has been considerably below normal. February precipitation over the area was also below normal. The deficiency in precipitation is most pronounced at the lower elevations.

SUMMARY OF MARCH 1 SNOW SURVEYS AND COMPARISON OF DATA

WITH THAT OF PREVIOUS YEARS BY WATERSHEDS

WATERSHEDS	Snow Depth		Water content		Number Courses in Average	Snow Density		1946 Water Content in percent of	
	Eleven Year Avg. *	1945	Eleven year Avg. *	1946		Eleven year Avg. *	1945	Eleven year avg. *	1946
	In.	In.	In.	In.		Percent	Percent	Percent	Percent
MISSOURI RIVER									
Jefferson River	25.4	21.5	6.4	29.6	6	25	26	125	145
Madison River	55.6	49.2	17.4	63.8	6	31	27	118	155
Gallatin River	32.2	26.1	8.3	39.3	7	26	23	131	182
Musselshell River	17.0	17.5	3.6	16.2	2	21	21	94	94
Missouri River**	27.5	23.2	6.7	27.7	11	24	22	113	152
Marias River	42.9	34.0	13.0	47.6	1	30	28	121	165
Yellowstone River	29.7	25.6	7.0	32.2	6	24	21	110	143
Milk River	13.1	15.0	4.6	22.8	1	25	30	120	122
Shoshone River	49.0	42.9	13.9	51.4	2	28	29	104	115
Bighorn River	29.8	28.1	7.7	30.6	7	26	25	108	118
Powder River		22.6							
North Platte River	43.4	43.7	14.0	46.8	10	29	28	101	103
Sweetwater River	35.4	35.0	9.0	37.1	2	25	22	120	139
Laramie River	30.6	37.6	8.7	34.9	8	23	26	103	93
Cheyenne River	20.9	22.0	4.3	17.2	3	21	21	70	64
South Platte River***	19.2	17.4	4.2	24.5	3	22	19	129	164
Crow Creek	16.1	21.9	3.5	11.9	1	22	21	69	53
Poudre River	32.6	36.6	8.8	35.9	6	27	27	115	101
Big Thompson River	43.5	44.4	11.4	43.9	2	26	27	107	101
St. Vrain River	34.9	39.6	8.7	32.8	1	25	24	102	94
Boulder Creek	26.6	36.8	8.1	32.0	2	30	23	136	108
Clear Creek	41.0	40.2	11.2	46.5	2	27	26	121	129
ARKANSAS RIVER	29.8	29.3	7.1	23.5	8	24	25	82	81

*Some for shorter periods.

**Between Helena and Great Falls

***Above Denver, Colo.

MISSOURI AND ARKANSAS RIVER WATERSHEDS

Summary of Federal and State Cooperative Snow Surveys
Issued March 12, 1946, at Fort Collins, Colo.

Main Drainage and Snow Course		Local Drainage		Location		Elev.	National Forest	Mar. 1 Snow Cover Measurements			
No.	Snow Course	State	Locality	Description	Av. Snow Depth			Av. Water Content	Av. @	In.	In.
JEFFERSON RIVER											
6	Camp Creek*	Idaho	6mi. N. Spencer	21-13N-36E	6800	Targhee	In.	32.2	29.7	7.7	
7	Moose Creek*	"	3mi. S. Gibbons P.	27-27N-21E	6200	Salmon	In.	40.5	40.5	8.1	
10	Gibbons Pass	Mont.	Gibbons Pass	4-2S-19W	7100	Bitterroot	In.	49.0	71.2	17.8	
30	Pipestone Pass	"	Pipestone Pass	11-1N-7W	7200	DeerLodge	In.	14.0	15.4	3.6	
Elkhorn Hot Spgs. Picnic Grounds Dell Dickey Bridge	Wise River	"	3mi. N. Polaris	15-4S-12W	8450	Beaverhead	In.	23.0	36.6	7.0	
	Bison Cr.	"	1mi. E. Elk Park	22-5N-6W	6500	DeerLodge	In.	13.8	9.8	2.3	
	Beaverhead R.	"	1mi. W. Dell	8-13S-9W	6100	Cff Forest	In.	1.8	3.5	0	
	Bighole R.	"	Dickey Bridge	11-1N-12W	5700	" "	In.	--	16.0	0.2	
Average for Drainage							In.	25.4	21.5	29.6	6.4
MADISON RIVER											
2	Aster Creek*	Wyo.	Lewis Lake	44-3N110-6W	7700	Vel. Nat. P.	In.	68.8	79.0	22.6	
8	Lewis L. Divide*	"	3mi. S. Lewis L.	44-2N110-7W	7900	" "	In.	93.5	90.1	30.8	
11	Norris Basin	"	Norris Basin	44-3N110-7W	7500	" "	In.	28.3	28.3	7.3	
3	Big Springs*	Idaho	Big Springs	34-14N-44E	6500	Targhee	In.	49.0	59.7	16.9	
16	West Yellowstone	Mont.	W. Yellowstone	34-13S-5E	6700	Gallatin	In.	27.1	28.3	9.9	
Twenty-one mile* Hebgen Dam	Greyling Cr.	"	3mi. S. Gallatin	1-11S-5E	7150	Vel. Nat. P.	In.	45.9	33.9	13.0	
	Cabin Creek	"	Hebgen Dam	22-11S-3E	6550	Gallatin	In.	40.8	30.8	11.3	
	Average for Drainage							In.	55.6	49.2	17.4
GALLATIN RIVER											
Devil's Slide	Hyalite Cr.	Mont.	20mi. S. Bozeman	14-5W-6E	8100	Gallatin	In.	50.3	42.4	14.0	
Hood Meadow Extn.	"	"	14mi. "	22-4S-6E	6600	"	In.	26.6	21.0	6.2	
Mystic Lake No. 1	Bozeman Cr.	"	12mi. SE. "	31-3S-7E	6600	"	In.	24.4	22.6	6.1	
Mystic Lake No. 2	"	"	" "	31-3S-7E	6600	"	In.	22.7	17.0	32.9	
Twenty-one Mile	Gallatin River	"	8mi. S. Gallatin	1-11S-5E	7150	Vel. Nat. P.	In.	45.9	33.9	51.6	
Ross Peak	Ross Cr.	"	12mi. N. Bozeman	10-1N-6E	7000	Gallatin	In.	25.6	20.3	30.2	
New World Trail	Gallatin River	"	8mi. SE. Bozeman	13-3S-6E	7000	"	In.	29.6	25.2	38.0	
Average for Drainage							In.	32.2	26.1	39.3	8.3
MUSSELSHELL RIVER											
Grasshopper*	Musselshell R.	Mont.	6mi. S. W. S. Spgs.	19-9N-8E	7000	Lewis & Clark	In.	16.9	16.3	3.6	
Orville Harris	Musselshell R.	"	12mi. E. W. S. Spgs.	31-10N-9E	6500	" "	In.	17.0	19.0	3.6	
Average for Drainage							In.	17.0	17.5	16.2	3.6

*Adjacent Drainage

@Average for period of record

#Readings February 15.

MISSOURI AND KANSAS RIVER WATERSHEDS

Summary of Federal and State Cooperative Snow Surveys

Issued March 12, 1946, at Fort Collins, Colo.

Main Drainage and		State	Location		Elev.	National Forest	Mar. 1 Snow Cover Measurements				
Local Drainage	Drainage		Locality	Description			Av. Snow Depth	Av. Water Content	1945	1946	1945
No.	Snow Course							In.	In.	In.	In.
MISSOURI RIVER**											
6	Chessman Res.	Mont.	11mi. SW. Helena	2-3N-6W	6200	Helena	15.2	7.3	13.2	3.7	1.1
11	Goat Mountain	"	26mi. W. Gilman	47-5N-12-9W	7000	Lewis & Clark	27.6	21.1	31.7	6.8	4.6
36	Stemple Pass	"	Stemple Pass	16-13N-7W	6900	Helena	31.8	28.0	32.5	7.4	6.8
41	Tennile Cr. Lower	"	17mi. SW. Helena	13-8N-6W	6250	"	22.3	17.6	20.8	4.9	3.4
42	Tennile Cr. Middle	"	"	13-8N-6W	6800	"	31.6	29.0	30.2	7.3	5.6
43	Tennile Cr. Upper	"	"	19-8N-5W	8000	"	36.3	30.8	36.4	9.6	7.4
	Grasshopper Cr.	"	6mi. S.W. S. Spgs	19-9N-8E	7000	Lewis & Clark	16.9	16.0	16.3	3.6	3.5
	Belt Creek	"	21mi. N.W.S. "	35-13N-7E	7950	"	40.5	34.5	45.8	10.3	8.8
	Eight Mile Cr.	"	12mi. E.W.S. "	31-10N-9E	6500	"	17.0	19.0	16.0	3.6	3.8
	Judith River	"	19mi. S. Lewiston	22-12N-18E	6000	"	23.9	17.7	23.8	6.4	3.7
	Flatwillow Cr.	"	18mi. SE. "	24-12N-17E	5500	"	39.1	34.5	38.1	10.1	6.3
			Average for Drainage				27.5	23.2	27.7	6.7	5.0
MARIAS RIVER											
7	Desert Mountain*	Mont.	4mi. S. Belton	24-31N-19W	5600	Flathead	42.9	34.0	47.6	13.0	9.6
20	Marias Pass	"	Summit	48-3N-13-4W	5250	Glacier NP	42.9	34.0	47.6	13.0	9.6
			Average for Drainage								
YELLOWSTONE RIVER											
14	Dome Lake	Wyo.	Dome Lake	11-53N-87W	8300	Big Horn	--	--	--	4.5	4.7
40	Lupine Creek	"	11mi. SE. Gardiner	44-9N-110-6W	7300	Yel. Nat. P.	19.4	--	--	3.8	10.3
41	Blacktail Deer Cr.	"	11mi. "	44-9N-110-6W	7500	"	--	--	--	6.0	6.4
	Camp Senia	Mont.	10mi. W. Red Ldg.	2-3S-13E	7370	Custer	20.0	--	20.7	7.5	8.5
3	Canyon	Wyo.	5mi. N. Canyon Jct	44-7N-110-5W	7750	Yel. Nat. P.	37.6	33.2	39.7	8.4	10.3
	Cooke City	Mont.	Cooke City	25-9S-14E	7400	Absaroka	24.9	22.2	30.5	6.0	3.8
	Grevice Mtn. #1	"	6mi. E. Gardiner	26-9S-9E	8400	Yel. Nat. P.	31.8	27.8	34.5	7.4	5.9
	Grevice Mtn. #2	"	7mi. "	26-9S-9E	8300	"	31.1	27.9	33.3	7.4	6.1
7	Lake Camp	Wyo.	3mi. NE. Fish. Br.	44-6N-110-4W	7850	"	36.6	29.0	36.8	8.4	8.5
	Porcupine	Mont.	12mi. NE. Wilsal	110-4N-10E	6500	Absaroka	16.0	13.6	18.3	3.7	2.8
	Hell's Canyon	"	26mi. SE. Livingston	23-5S-12E	6000	"	10.1	10.1	--	4.2	4.2
	Independence	"	26mi. NE. Gardiner	22-7S-12E	8000	"	38.3	38.3	--	9.7	9.7
			Average for Drainage				29.7	25.6	32.2	7.0	5.4
MILK RIVER											
	Rocky Boy	Mont.	Bear Paw Mt.	15-28N-16E	--	Cff Forest	18.1	15.0	22.8	4.6	4.5

*Adjacent Drainage

@Average for period of record

**Between Helena and Great Falls

MISSOURI AND ARKANSAS RIVER WATERSHEDS
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Main Drainage and No. Snow Course	Local Drainage	State	Locality	Description	Elev. National		Mar. 1 Snow Cover Measurements			
					Av. Snow Depth	Forest	Av. Snow Depth	Av. Water Content	Av. Snow Depth	Av. Water Content
					In. 1945	In. 1946	In. 1945	In. 1946	In. 1945	In. 1946
SHOSHONE RIVER										
32	Middle Creek	Wyo.	Sylvan Pass	12-52N-110W	7100	Yel. Mat. P.	45.2	37.1	42.7	12.4
50	Shoshone R.	"	Brooks Lake	23-44N-110W	9200	Shoshone	52.8	43.7	60.1	15.4
				Average for Drainage			49.0	42.9	51.4	13.9
BIGHORN RIVER										
14	Shell Cr.	Wyo.	Dome Lake	11-53N-87W	8800	Bighorn	20.1	19.8	15.5	4.3
45	Sawmill Glade	"	13mi. SW. Lander	3-31N-111W	8500	Shoshone	29.0	26.4	30.6	7.2
46	Blue Ridge	"	15mi. " "	23-31N-101W	9500	"	35.0	34.2	38.0	9.1
47	South Pass	"	19mi. " "	13-30N-101W	9000	"	22.2	23.3	24.2	5.0
49	Sheridan Cr. R. S. #2	"	16mi. NW. Dubois	3-42N-109W	7500	"	52.8	48.7	60.1	15.4
50	Wind River	"	Brooks Lake	23-44N-110W	9200	"	28.7	26.2	25.5	7.5
51	St. Lawrence Cr.	"	27mi. NW. Lander	26-1N-4W	9000	Shos. I. R.	21.0	18.0	20.0	5.4
52	Mosquito Park R. S.	"	18mi. " "	23-28-3W	9500	"	29.8	23.1	30.6	7.7
53	Wind River	"	9mi. NW. Dubois	27-42N-108W	8750	Shoshone	29.8	23.1	30.6	7.7
54	Horse Creek	"	12mi. N. Dubois	1-43N-107W	8000	"	29.8	23.1	30.6	7.7
				Average for Drainage			29.8	23.1	30.6	7.7
POWDER RIVER										
30	Middle Fork	"	23mi. W. Kaycee	18-43N-85W	7500	Off Forest	22.6	22.6	4.1	4.1
NO. PLATTE RIVER										
1	Cameron Pass	Colo.	Cameron Pass	2-6N-76W	10300	Roosevelt	48.7	49.2	53.7	15.5
7	Park View	"	7mi. SE. Rand	24-5N-78W	9200	Routt	30.1	30.1	28.7	7.1
8	Columbine Lodge	"	Rbt. Ears Pass	21-5N-82W	9300	"	61.5	60.1	69.1	17.8
62	Willow Cr. Pass	"	Willow Cr. Pass	1-4N-78W	9500	Arapaho	35.7	36.3	34.8	8.8
7	Bottle Creek	Wyo.	7mi. SW. Encampment	24-14N-85W	8200	Medicine Bow	35.9	38.8	29.9	9.9
8	Webber Spring	"	10mi. W. "	27-14N-85W	9000	"	45.0	48.8	40.7	12.6
9	Old Battle	"	12mi. W. "	29-14N-85W	9800	"	73.7	73.9	61.7	23.4
37	North French Cr.	"	Cent. / Saratoga	27-16N-80W	10200	"	69.9	70.8	70.0	22.8
38	N. Barret Cr. #2	"	" "	30-16N-80W	9400	"	51.4	48.2	50.2	14.3
39	Ryan Park #2	"	" "	34-16N-81W	8400	"	32.2	30.8	29.0	8.2
				Average for Drainage			48.4	48.7	46.8	14.0
SWEETWATER RIVER										
29	Grannier Meadows	Wyo.	20mi. SW. Lander	19-30N-100W	9000	Shoshone	35.7	35.8	36.2	8.9
47	South Pass*	"	19 " "	13-30N-101W	9000	"	35.0	34.2	38.0	9.1
				Average for Drainage			35.4	35.0	37.1	9.0

*Average for period of record.

*Adjacent Drainage

MISSOURI AND ARKANSAS RIVER WATERSHEDS

Summary of Federal and State Cooperative Snow Surveys

Issued March 12, 1946, at Fort Collins, Colorado

Main Drainage and Snow Course	Local Drainage	State	Location Locality	Elev.	National Forest	Mar. 1 Snow Cover Measurements							
						Av. @	1045	1046	Av. @	1045	1046	Av. @	1045
LARAMIE RIVER	Nash Fork	Wyo.	7mi. NW. Centennl Fox Park	10200	Medicine Bow	50.3	52.3	56.3	16.1	In.	In.	16.2	In.
	Fox Creek	"	10mi. SE. Laramie	9200	"	26.8	33.0	24.3	7.0	16.2	9.0	6.2	16.3
	Soldier Cr.	"	3mi. NW. Centennl	8700	"	16.1	21.9	11.9	3.5	9.0	4.5	2.4	6.2
	Libby Creek	"	5mi. NW. Centennl	8700	"	26.6	32.4	32.8	6.7	7.9	7.9	7.1	7.1
	Nash Fork	"	4mi. N. Chambers L.	9500	"	28.2	32.6	32.8	7.5	8.5	7.4	7.8	7.8
	Laramie R.	Colo.	10mi. W.R. Feather	8600	Roosevelt	36.4	42.1	30.9	0.8	7.4	10.7	11.5	6.3
	Leadman Cr.	"	8mi. NW. Glendevy	10200	"	50.3	56.4	50.8	12.7	13.4	14.1	14.1	14.1
	LaGarde Cr.	"	Average for Drainage	9800		30.6	37.6	34.9	8.7	9.7		9.0	9.0
CHEYENNE RIVER	Spearfish Cr.	S. Lak.	21mi. SW. Spearfish	6500	Blk Hills	23.9	27.0	19.3	5.4	6.3		4.0	4.0
	Castle Cr.	"	11mi. NW. Peerfld	6800	"	24.4	24.3	22.1	4.6	4.7		3.3	3.3
	Silver Cr.	"	3mi. NW. Deerfield	6010	"	14.4	14.6	10.1	3.0	3.2		1.6	1.6
	Average for Drainage		Average for Drainage			20.9	22.0	17.2	4.3	4.7		3.0	3.0
SOUTH PLATTE RIVER (above Denver)	S. Platte R.	Colo.	Hosier Pass	11400	Pike	31.5	24.5	36.9	7.4	5.2		8.9	8.9
	"	"	Fairplay	10000	"	3.6	5.0	T	0.4	0.5		T	T
	Jefferson Cr.	"	5mi. NW. Jefferson	10100	"	23.1	22.6	36.6	4.8	4.2		7.4	7.4
	Average for Drainage		Average for Drainage			19.2	17.4	24.5	4.2	3.3		5.4	5.4
CROW CREEK	Crow Creek	Wyo.	10mi. SE. Laramie	8700	Medicine Bow	16.1	21.9	11.9	3.5	4.5		2.4	2.4
	Average for Drainage		Average for Drainage			16.1	21.9	11.9	3.5	4.5		2.4	2.4
POUDRE RIVER	Joe Wright Cr.	Colo.	Cameron Pass	10300	Roosevelt	48.7	49.2	53.7	15.5	15.2		18.6	18.6
	Poudre River	"	Chambers Lake	9000	"	21.6	30.9	27.6	5.3	7.5		5.8	5.8
	"	"	2mi. E. Chambers L.	8600	"	0.4	15.1	10.7	1.8	3.4		1.6	1.6
	N. Poudre R.	"	10mi. W.R. Feather	10200	"	38.5	42.1	30.9	0.8	10.7		11.5	11.5
	Big S. Poudre	"	1mi. SW. Milner P.	10600	Ry. Mtn. NP	54.9	52.8	56.4	15.5	15.8		17.7	17.7
	L.S. Poudre	"	2mi. NW. Pingree P.	9500	Roosevelt	22.2	20.2	26.9	4.9	7.5		5.4	5.4
*On adjacent drainage	Average for period of record.		Average for period of record.			32.6	36.6	35.9	8.8	10.0		10.1	10.1

*On adjacent drainage @Average for period of record.

MISSOURI AND ARKANSAS RIVER WATERSHEDS
Summary of Federal and State Cooperative Snow Surveys
Issued March 12, 1946, at Fort Collins, Colo.

Main Drainage and Snow Course	Local Drainage	State	Location		Elev. National Forest	Mar. 1 Snow Cover Measurements			
			Locality	Description		Av. Snow Depth 1945	Snow Depth 1946	Av. @ 1945	Water Content 1946
						In.	In.	In.	In.
BIG THOMPSON									
65 Lake Irene*	Big Thompson R.	Colo.	1 mi. SW. Milner P.	8-5N-75W	10600	54.9	56.4	15.5	17.7
95 Hidden Valley #2	Hidden Valley Cr.	"	9 mi. W. Estes P.	23-5N-74W	9550	32.1	31.4	7.4	6.6
				Average for Drainage		43.5	45.9	11.4	12.2
ST. VRAIN RIVER									
41 Wild Basin	N. St. Vrain R.	Colo.	5 mi. W. Allen's P.	24-3N-74W	10000	34.9	32.8	8.7	8.9
BOULDER CREEK									
5 E. Port. Moffat T.	S. Boulder Cr.	Colo.	East Portal	2-2S-74W	9400	10.6	8.6	2.6	1.8
60 University Camp #2	N. Boulder Cr.	"	5 mi. SW. Ward	28-1N-73W	10300	42.6	55.5	13.6	20.2
				Average for Drainage		26.6	32.0	8.1	11.0
CLEAR CREEK									
61 Loveland Pass #2	Clear Creek	Colo.	10 mi. W. Georgetown	27-4S-76W	10100	38.1	46.2	9.6	12.3
97 Grizzly Peak*	"	"	1 mi. W. Loveland	2-5S-76W	11250	43.9	46.8	12.9	14.8
				Average for Drainage		41.0	46.5	11.2	13.6
ARKANSAS RIVER									
19 Tennessee Pass	Tennessee Cr.	Colo.	Tennessee Pass	21-8S-80W	10200	31.4	33.1	7.2	6.0
21 Twin Lakes Tun.	Lake Creek	"	9 mi. W. Twin Lakes	22-11S-82W	10500	29.1	30.2	7.8	7.1
42 Marshall Creek*	Poncha Creek	"	Marshall Pass	24-43N-6E	10800	39.2	26.3	6.8	6.4
43 Poncha Creek	"	"	"	19-43N-7E	10500	29.6	15.9	8.2	4.5
72 Whiskey Creek #2	Whiskey Cr.	"	Whiskey Cr. P.	37-2N-105.2W	10300	21.9	9.1	5.7	2.8
74 LaVeta Pass #2*	Cuchara Cr.	"	LaVeta Pass	22-28S-70W	9300	33.7	16.7	6.8	4.6
78 Four Mile Park #2	Lake Creek	"	3 mi. SW. Twin L.	23-11S-81W	9700	10.8	7.4	2.6	1.7
79 Fremont Pass #2	E. Fork Ark. R.	"	Fremont Pass	2-8S-79W	11400	47.1	49.2	11.8	13.3
92 Monarch Pass	S. Fork Ark. R.	"	Monarch	16-49N-6E	10500	51.3	23.5	7.1	5.8
				Average for Drainage		29.8	29.3	7.1	7.2

* Adjacent Drainage

@ Average for period of record

The following organizations cooperate in the snow surveys and irrigation water supply forecasts for the Colorado, Missouri-Arkansas and Rio Grande watersheds by furnishing funds or services.

STATE

Colorado State Engineer
Wyoming State Engineer
Utah State Engineer
New Mexico State Engineer
Montana State Engineer
Nebraska State Engineer
Colorado Experiment Station
Colorado Extension Service
Montana Experiment Station
Utah Experiment Station

FEDERAL

Department of Agriculture
Forest Service
Soil Conservation Service
Department of Interior
Bureau of Reclamation
Indian Service
Geological Survey
National Park Service
Department of Commerce
Weather Bureau
War Department
Army Engineer Corps

PUBLIC UTILITIES

Colorado Public Service Company
Western Colorado Power Company
Montana Power Company
Denver and Rio Grande Western R. R. Company

MUNICIPALITIES

City of Bozeman
City of Denver
City of Boulder

WATER USERS ORGANIZATIONS

Poudre Valley Water Users' Association
Arkansas Valley Ditch Association
Colorado River Water Conservation District

IRRIGATION PROJECTS

Farmers Reservoir and Irrigation Company
San Luis Valley Irrigation District
Santa Maria Reservoir Company
Costilla Land Company
Uncompahgre Valley Water Users' Association
Wyoming Development Company
Goshen Irrigation District
Kendrick Project
Pathfinder Irrigation District
Salt River Valley Water Users' Association
San Carlos Irrigation and Drainage District

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